



Name :

Roll No. :

Invigilator's Signature :

**CS/M.Tech(ECE)/SEM-2/MCE-204D/2011
2011**

MICROWAVE MEASUREMENT TECHNIQUES

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

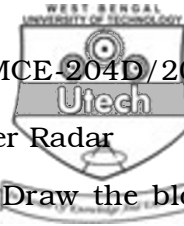
*Candidates are required to give their answers in their own words
as far as practicable.*

Answer Questions No. 1 and any *four* from the rest.

1. Answer in brief any *seven* of the following : 7 × 2
- a) What is the main difference between a scalar network analyser and a vector network analyser ?
 - b) What is meant by 'time in passband' in a spectrum analyser ?
 - c) Why reflectometer technique is superior to slotted line technique of impedance measurement ?
 - d) In a spectrum analyser, why is IF chosen above the highest frequency of tuning range ?
 - e) What is minimum and maximum range of a pulse radar system ?



- f) How is error due to gain variation avoided in a Dicke radiometer ?
- g) What is Total Harmonic Distortion (THD) ?
- h) If a transmission line of characteristic impedance (Z_o) is terminated with a load impedance $Z_L = \frac{1}{2} Z_o$ then what type of waveform will be obtained in a TDR display ?
- i) Why amplitude modulation of a microwave signal is done for detection with a diode detector ?
- j) What is the difference between an active and a passive microwave sensor ? Give one example of each.
2. Draw the block diagram of an RF powermeter using thermistor sensor and explain its principle of operation. What are the differences between a thermistor and a barretter ? 10 + 4
3. What is transfer oscillator technique of frequency measurement ? Draw the block diagram of a microwave frequency counter using transfer oscillator technique and explain its operation. 4 + 10



4. What are the advantages of an FM CW Doppler Radar over : (i) Pulse Radar and (ii) CW Radar ? Draw the block diagram of an FM CW Doppler radar and explain how range and velocity of a moving object can be determined with its help. 4 + 10
5. Draw the block diagram of a superheterodyne spectrum analyser and explain the function of each block of it. What is meant by frequency resolution of a spectrum analyser ? Which part of a spectrum analyser determines its frequency resolution and how ? 10 + 1 + 3
6. What is a Time Domain Reflectometer (TDR) and what are its applications ? Obtain the shape of reflected waveform when the load impedance Z_L consists of a resistor and an inductor in series. What will happen when inductance value is very small ? 4 + 8 + 2
7. Write note on any *one* of the following : 14
- a) Power meter using thermocouple sensor
 - b) Impedance measurement using shift in minima method
 - c) Vector Network Analyser.

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